IN THE APPLICATION

OF

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FOR

Image Data Analysis Security Camera

FILED WITH

THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to security camera devices and, more specifically, to a self contained image data analysis security camera containing logic circuits to capture an initial image and a processor to compare subsequent images thereto. The images are transmitted to a central station allowing the field of view to be displayed on a monitor and recorded by a VCR or other suitable recording device. The present invention may be used for conventional monitoring wherein streaming video is sent directly to the monitor and recording device without image comparison. When in security mode the processor in the camera continually compares incoming subsequent images with the initial captured image stored in the memory until a discrepancy between the two images is detected and initiates an alarm mode. A discrepancy between the initial captured image and an incoming subsequent image initiates an alarm mode wherein an audible and/or visual alarm is activated at the central station and/or other desired location. The alarm mode remains in effect until the operator depresses a memory control switch which then clears the memory and

captures the current image which is then used for comparison to any subsequent images for the duration of the security mode or until another discrepancy is detected by the processor resulting in another alarm condition.

The present invention includes an alarm sensitivity adjustment means to the processor to allow the operator to determine how much of a discrepancy between the captured image and the stored image is required to initiate the alarm mode. For instance, a high sensitivity setting may initiate the alarm mode due to the movement of a fly or other small object, whereas the introduction of a cat into the field of view during a medium sensitivity setting would be required to have the processor set off the alarm and a low sensitivity setting would require the introduction or movement of a larger object such as human to initiate an alarm.

Additional options to the present invention include a power loss detection battery backup and connection less transmission of image signals, remote control switches, alarms and other appropriate remote components.

Description of the Prior Art

There are other surveillance cameras for security systems, while these surveillance cameras may be suitable for the purposes for which they were designed, they would not be as suitable for the purposes of the present invention, as hereinafter described.

SUMMARY OF THE PRESENT INVENTION

A primary object of the present invention is to provide a surveillance camera having data analysis capabilities for capturing an image and comparing subsequent incoming images thereto to detect activity in the targeted area.

Another object of the present invention is to provide an image data analysis security camera wherein a processor and logic circuits are integral therewith.

Still another object of the present invention is to provide an image data analysis security camera that may be used with existing security monitors and alarms.

Yet still another object of the present invention is to provide an image data analysis security camera that may be used with just an alarm to alert the necessary personnel that an alarm condition exists in the secured area.

Yet another object of the present invention is to provide an image data analysis security camera that will overcome human error of negligence of security personnel.

Another object of the present invention is to provide an image data analysis security camera that can easily and cost-effectively be installed and integrated with existing hardware.

Still another object of the present invention is to provide an image data analysis security camera that is simple and easy to use.

Still yet another object of the present invention is to provide an image data analysis security camera that is inexpensive to manufacture and operate.

Additional objects of the present invention will appear as the description proceeds.

The foregoing and other objects and advantages will appear from the description to follow. In the description reference is made to the accompanying drawings, which forms a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. These embodiments will be described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural changes may be made without departing from the scope of the invention. In the accompanying drawings, like reference characters designate the same or similar parts throughout the several views.

The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is best defined by the appended claims.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

In order that the invention may be more fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is an illustrative view of the present invention;

FIGURE 2 is a block diagram of the present invention;

FIGURE 3 is a flow chart of all operational phases of the image data analysis security camera of the present invention;

FIGURE 4 is an interconnection diagram of the image data analysis security camera of the present invention;

FIGURE 5 is a general overview interconnection diagram of the image data analysis security camera of the present invention in monitor mode;

FIGURE 6 is an interconnection diagram of the image data analysis security camera of the present invention in image capture mode;

FIGURE 7 is an interconnection diagram of the image data analysis security camera of the present invention in security mode;

FIGURE 8 is an interconnection diagram of the image data analysis security camera of the present invention in alarm mode;

FIGURE 9 is an interconnection diagram of the image data analysis security camera of the present invention in reset mode;

FIGURE 10 is an interconnection diagram of the image data analysis security camera of the present invention with additional elements;

FIGURE 11 is an illustrative view wherein a plurality of image data analysis security cameras is in use with a single computer;

FIGURE 12 is an illustrative view of the present invention in use in security mode;

FIGURE 13 is an illustrative view of the present invention in use in alarm mode;

FIGURE 14 is an illustrative view of the control switches of the present invention; and

FIGURE 15 is a block diagram of the present invention transmitting to an alarm only.

DESCRIPTION OF THE REFERENCED NUMERALS

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, the figures illustrate the Image Data Analysis Security Camera System of the present invention. With regard to the reference numerals used, the following numbering is used throughout the various drawing figures.

10 Image Data Analysis Security Camera System

12 image data analysis security camera

14 monitor

16 recording device

18 alarm

20 remote monitoring station

24 lens

26 light sensitive electronic chip

28 processor

30 memory

32 memory control circuit

34 image circuit

36 user controls

38 control switches

40 variable alarm sensitivity switch

42 power source

44 memory control switch

46 power and monitor switch

48 image capture switch

50 security mode switch

52 first electrical connection

54 second electrical connection

56 third electrical connection

58 fourth electrical connection

60 fifth electrical connection

62 sixth electrical connection

63 control connection

64 first signal connection

66 second signal connection

68 third signal connection

70 fourth signal connection

72 fifth signal connection

74 sixth signal connection

76 seventh signal connection

78 eighth signal connection

80 ninth signal connection

82 tenth signal connection

84 eleventh signal connection

86 camera receiver

88 monitor station receiver

90 camera transmitter

92 user control transmitter

94 battery

96 computer

98 computer interface

100 operator

102 intruder

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The following discussion describes in detail one embodiment of the invention. This discussion should not be construed, however, as limiting the invention to those particular embodiments, practitioners skilled in the art will recognize numerous other embodiments as well. For definition of the complete scope of the invention, the reader is directed to appended claims.

FIGURE 1 is an illustrative view of the present invention. The image data analysis security camera system **10** is a security system designed to monitor and record streaming video in real time with an incorporated alarm mode that takes a first image with all sampled subsequent images compared thereto, whereby, any deviance found in subsequent images initiates an alarm condition. The system is comprised of at least one image data analysis security camera **12** in communication with a monitor **14**, recording device **16** and audible and/or visual alarm device **18** with logic circuits integral with the camera **12**. The system **10** can be engaged in either a monitor mode or a security mode. In the monitor mode the camera images are viewed on the monitor **14** as well as being

recorded on the recording device **16**. When the security mode is initiated, a first image is obtained and stored in memory with the real time streaming video images sampled, based on the processor capabilities, and compared to the first image. If no deviation from the first image is detected another image is captured with the process continuing while the system is in security mode. When a deviation in image comparison occurs, an alarm **18** condition is initiated. Real time video monitoring and recording continue throughout security mode.

FIGURE 2 is an illustrative block diagram of the present invention **10**. The image data analysis security camera system **10** of the present invention comprises components that are readily available, inexpensive and easily installed without the need for motion detectors, lasers, heat sensors, electrical contacts on doors and windows, or audio sensors. All of which would require a greater amount of effort to install, maintain and fund. The present invention **10** may also be used as a standard monitor wherein the transmitted image is viewable on the monitor **14** and recorded on a video recording device **16** but without involving the logic circuit in the event that there is authorized activity in the area being monitored. The data image analysis security camera **12** comprises a lens **24**, a light sensitive electronic chip **26**, a processor **28**, a memory **30**, a memory

control circuit **32** and an image circuit **34**. The image data analysis security camera **10** is in communication with an external power source **42** a monitor **14**, an audible and/or visual alarm **18**, a recording device **16**, user controls **36** including control switches **38** and a variable alarm sensitivity switch **40** based in a remote monitoring station **20**.

FIGURE 3 is a flow chart of all operational work phases of the image data analysis security camera **12** of the present invention. Shown is a flow chart of the present invention demonstrating the process and inter-relationships of the various components.

FIGURE 4 is a general overview interconnection diagram of the image data analysis security camera security system of the present invention **10**. Shown are the primary components of the present invention **10** along their electrical connections, signal connections and various switches. The physical configuration of the present invention **10** may be varied without deviating from the intent and spirit of the present invention **10**. The signal connections are depicted in dashed line and the current lines are shown in solid. Arrows indicate an active signal or current. The present invention **10** is off wherein the power

and monitor switch **46** is open. The present invention **10** comprises a processor **28**, a memory **30**, a memory control circuit **32**, an image circuit **34**, a lens **24**, a light-sensitive electronic chip **26**, a monitor **14**, a recording device **16**, an alarm **18**, a power source **42** and user controls **36** including a memory control switch **44**, a power and monitor switch **46**, an image capture switch **48**, a security mode switch **50** and a variable alarm sensitivity switch **40**. The circuit of the present invention **10** further includes a first electrical connection **52** running from the power source **42** to the power and monitor switch **46**, a second electrical connection **54** connecting the power and monitor switch **46** to the image circuit **34**, a third electrical connection **56** between the memory **30** and the second electrical connection **54**, a fourth electrical connection **58** connecting the processor **28** to the second electrical connection **54**, a fifth electrical connection **60** between the second electrical connection **54** and the memory control switch **44**, a sixth electrical connection **62** between the memory control switch **44** and the memory control circuit **32**, a control connection **63** communicating between the variable alarm sensitivity switch **40** and the processor **28**, a first signal connection **64** running from the light-sensitive-electronic chip **26** to the image circuit **34**, a second signal connection **66** between the image circuit **34** to the monitor **14**, a third signal connection **68** connecting the recording device **16** to

the second signal connection **66**, a fourth signal connection **70** between the light sensitive electronic switch **26** and the image capture switch **48**, a fifth signal connection **72** running from the image capture switch **48** to the memory **30**, a sixth signal connection **74** from the memory **30** to the processor **28**, a seventh signal connection **76** from the processor **28** to the alarm **18**, an eighth signal connection **78** connecting the security mode switch **50** to the fourth signal connection **70**, a ninth signal connection **80** from the security mode switch **50** to the processor **28**, a tenth signal connection **82** from the light sensitive electronic chip **26** to the memory control circuit **32** and an eleventh signal connection **84** from the memory control circuit **32** to the memory **30**.

FIGURE 5 is an interconnection diagram of the image data analysis security camera system of the present invention **10** in monitoring mode. The present invention **10** is in the monitor mode wherein the power and monitor switch **46** is closed and delivering current for all components thereby activating the image circuit **34** which transmits the signal viewed by the lens **24** and the light sensitive electronic chip **26** to the monitor **14** and the video recorder **16**. Current travels from the power source **42** along the first electrical connection **52** to the closed power and monitor switch **46** along the second electrical

connection **54** to the image circuit **34**. Current also travels from the second electrical connection **54** through the fourth electrical connection **58** to the processor **28** which in not processing at this point, through the third electrical connection **56** to the memory **30** which is empty and through the fifth electrical connection **60** to the open memory control switch **44**. The image signal is transferred along the first signal connection **64** to the image circuit **34**, along the second signal connection 66 to the monitor **14** and from the second signal connection **66** along the third signal connection **68** to the recording device **16.** The image signal simultaneously travels from the light-sensitive electronic chip **26** along the fourth signal connection **70** to the open image capture switch **48** and from the fourth signal connection **70** along the eighth signal connection **78** to the open security mode switch **50**. The image signal is also transmitted from the light-sensitive electronic chip **26** along the tenth signal connection **82** to the memory control circuit **32** which remains inactive until a current is applied thereto.

FIGURE 6 is an interconnection diagram of the image data analysis security camera system of the present invention **10** in image capture mode. The

image capture switch **48** is a contact switch that is momentarily closed allowing the image signal to travel from the light-sensitive electronic chip **26** to the memory **30** where the image is stored and read by the processor **28**. The processor **28** will not process until it receives two signals, one from the memory **30** and one from the electronic chip **26** via a closed security mode switch **48** which is open during the image capture stage. The image capture switch **48** is a contact switch that opens when released by the operator. Current travels along the first electrical connection **52** to the closed power and monitor switch **46** along the second electrical connection **54** to the image circuit **34**. Current also travels from the second electrical connection **54** through the fourth electrical connection **58** to the processor **28**, through the third electrical connection **56** to the memory **30** through the sixth signal connection **74** to the processor **28** and through the fifth electrical connection **60** to the open memory control switch **44**. The image signal is transferred along the first signal connection **64** to the image circuit **34**, along the second signal connection **66** to the monitor **14** and from the second signal connection **66** along the third signal connection **68** to the recording device **16.** The image signal simultaneously travels from the light-sensitive electronic chip **26** along the fourth signal connection **70** to the closed image capture switch **48** and along the fifth signal connection **72** to the memory

30 and from the fourth signal connection 70 along the eighth signal connection 78 to the open security mode switch 50. The image signal is also transmitted from the light-sensitive electronic chip 26 along the tenth signal connection 82 to the memory control circuit 32 which is not operating.

FIGURE 7 is an interconnection diagram of the image data analysis security camera system of the present invention 10 in security mode. Shown is the present invention 10 in the security mode wherein the image capture switch 48 has been released and is open and the security mode switch 50 is closed thereby transmitting the image viewed by the lens 24 from the electronic chip 26 to the processor 28 which is now processing and comparing the captured image from the memory 30 with each subsequent image received from the electronic chip 26. Prior to processing the variable sensitivity switch 40 is adjusted by the user to inform the processor 28 through the control connection 63 how great a degree of deviation is desired to initiate an alarm condition. Current travels along the first electrical connection 52 to the closed power and monitor switch 46 along the second electrical connection 54 to the image circuit 34. Current also travels from the second electrical connection 54 through the fourth electrical connection 58 to the processor 28, through the third electrical

connection **56** to the memory **30** and through the fifth electrical connection **60** to the open memory control switch **44**. The image signal is transferred along the first signal connection **64** to the image circuit **34**, along the second signal connection **66** to the monitor **14** and from the second signal connection **66** along the third signal connection **68** to the recording device **16.** The image signal simultaneously travels from the light-sensitive electronic chip **26** along the fourth signal connection **70** to the open image capture switch **48** and from the fourth signal connection **70** along the eighth signal connection **78** to the closed security mode switch **50** and along the ninth signal connection **80** to the processor **28**. The image signal is also transmitted from the light-sensitive electronic chip **26** along the tenth signal connection **82** to the memory control circuit **32** which is inactive. The captured image in the memory **30** is read by the processor **28** over the sixth signal connection **74**.

FIGURE 8 is an interconnection diagram of the image data analysis security camera system of the present invention **10** in alarm mode. Shown is the present invention **10** in the alarm stage wherein the processor **28** has detected a discrepancy between the image stored in the memory **30** and the image transmitted from the electronic chip **26** and has responded by sending a signal to

activate the alarm **18**. The present invention **10** remains in an alarm state until the memory control switch **44** is closed to overwrite the stored image in the memory **30** with the current image sent from the light sensitive electronic chip **26**. Current travels along the first electrical connection **52** to the closed power and monitor switch **46** along the second electrical connection **54** to the image circuit **34**. Current also travels from the second electrical connection **54** through the fourth electrical connection **58** to the processor **28**, through the third electrical connection **56** to the memory **30** and through the fifth electrical connection **60** to the open memory control switch **44**. The image signal is transferred along the first signal connection **64** to the image circuit **34**, along the second signal connection **66** to the monitor **14** and from the second signal connection **66** along the third signal connection **68** to the recording device **16.** The image signal simultaneously travels from the light-sensitive electronic chip **26** along the fourth signal connection **70** to the open image capture switch **48** and from the fourth signal connection **70** along the eighth signal connection **78** to the closed security mode switch **50** and along the ninth signal connection **80** to the processor **28**. The image signal is also transmitted from the light-sensitive electronic chip **26** along the tenth signal connection **82** to the memory control circuit **32** which is not working. The captured image in the memory **30** is sent to

the processor **28** over the sixth signal connection **74**. A signal is sent from the processor **28** over the seventh signal connection **76** to activate the alarm **18**. The processor **28** and the variable alarm sensitivity switch **40** communicate via the control connection **63**.

FIGURE 9 is an interconnection diagram of the image data analysis security camera system of the present invention **10** in reset mode. Shown is the present invention **10** in the reset stage wherein the memory control switch **44** is closed thereby activating the memory control circuit **32** which transfers an image signal from the electronic chip **26** to the memory **30** which then overwrites the previous captured image with the current one to achieve equilibrium between the captured image and the real time image thereby causing the processor **28** to stop the alarm **18** and return to security mode. The memory control switch **44** is also a contact switch which opens immediately after closing the circuit. Current travels along the first electrical connection **52** to the closed power and monitor switch **46** along the second electrical connection **54** to the image circuit **34**. Current also travels from the second electrical connection **54** through the fourth electrical connection **58** to the processor **28**, through the third electrical connection **56** to the memory **30** and through the fifth electrical connection **60** to

the closed memory control switch **44** over the sixth electrical connection **62** to activate the memory control circuit **32**. The image signal is transferred along the first signal connection **64** to the image circuit **34**, along the second signal connection **66** to the monitor **14** and from the second signal connection **66** along the third signal connection **68** to the recording device **16.** The image signal simultaneously travels from the light-sensitive electronic chip **26** along the fourth signal connection **70** to the open image capture switch **48** and from the fourth signal connection **70** along the eighth signal connection **78** to the closed security mode switch **50** along the ninth signal connection **80** to the processor **28**. The image signal is also transmitted from the light-sensitive electronic chip **26** along the tenth signal connection **82** to the memory control circuit **32** and along the eleventh signal connection **84** to the memory **30** then through the sixth signal connection **74** to the processor **28**. With this, we overwrite the previous captured image with the current one thereby completing the reset process.

FIGURE 10 is an interconnection diagram of the image data analysis security camera system of the present invention **10** with additional elements. Shown is the security system **10** with an additional element comprising

connection less communications. To suit user requirements, connection less communication may be utilized between select components or the complete security system. This additional element provides improved means for setup and transportability. The camera **12** comprises a lens **24** a light-sensitive electronic chip **26**, a processor **28**, a memory **30**, a memory control circuit **32** an image circuit **34**, a transmitter **90**, a receiver **86** and a battery **94**. The camera **12** is in communication with a remote alarm **18**.The emergency battery **94** serves to provide a back-power source in the event that the external power source **42** is compromised. The termination of electricity from the external power source **42** will automatically transfer power distribution to the emergency battery **94** thereby assuring the continuous operation of the present invention **10** until the external power is restored. The remote monitoring station **20** comprises user controls **36** including control switches **38**, a variable alarm sensitivity switch **40**, a transmitter **32**, a recording device **16**, a monitor **14** and a receiver **88**.

FIGURE 11 is an illustrative view wherein a plurality of image data analysis security cameras **12** is in use with a single computer **96**. The present invention **10** may easily be adapted for multiple cameras **12** to simultaneously be in use with a single system. Shown is a configuration wherein the cameras **12**

are in communication with a computer interface **98** that routes the appropriate signals to the computer **96** and, if necessary, to the pertinent alarms **18**. Keystrokes may be used by the operator to switch between cameras **12** for manual monitoring and to activate the control switches.

FIGURE 12 is an illustrative view of the present invention in use. Shown is the image data analysis security camera system of the present invention in use wherein the camera **12** is installed in a secure area. The camera **12** may be set in monitor mode wherein the image is sent directly to the monitor **14** and the recording device **16** or the operator **100** may capture an image thereby initiating the security mode wherein subsequent images are compared thereto. An alarm **18** will be activated if a deviation between the real time image and the sampled image stored in the memory is detected by the processor. The operator **100** determines the operation and function of the present invention from a remote location through the manipulation of user controls **36**.

FIGURE 13 is an illustrative view of the present invention in use. Shown is the image data analysis security camera system of the present invention in use wherein the processor in the camera **12** has detected an image differentiation

between the real time image and the captured image because an intruder **102** has entered the secured area and has initiated the alarm mode. An audible/visual alarm **18** has been activated and has alerted security personnel to the breach of the secured area. The image of the secured area is being transmitted to the monitor **14** and recording device **16** in the remote monitoring station. The present invention will remain in alarm mode until the operator **100** presses the memory control switch on the user controls **36** to clear the previously captured image and replace it with the current one thus returning the system to security mode.

FIGURE 14 is an illustrative view of the user controls **36** including control switches **38**. The control switches **38** of the present invention are designed to be positioned and operated at the monitoring station. The switches **38** include a power and monitor switch **46**, an security mode switch **50**, an image capture switch **48**, a memory control switch **44** and an variable alarm sensitivity switch **40**. The variable alarm sensitivity switch **40** serves to allow the operator to adjust the degree of differentiation required to initiate the alarm mode. This is achieved through the use of a variable resistor or other such appropriate component suitable for the objective of the variable alarm sensitivity switch **40**.

The variable alarm sensitivity switch **40** informs the processor how great a deviation between the captured image and the real time image is required to initiate an alarm condition.

FIGURE 15 is an illustrative block diagram of the present invention **10**. The data image analysis security camera **12** of the present invention **10** may also be used with just an alarm **18** without a link to a monitor or a recording device. The data image analysis security camera **12** comprises a lens **24**, a light sensitive electronic chip **26**, a processor **28**, a memory **30**, a memory control circuit **32** and an image circuit **34**. The image data analysis security camera **12** is in communication with an external power source **42**, an audible and/or visual alarm **18**, user controls **36** including control switches **38** and a variable alarm sensitivity switch **40** based in a remote monitoring station **20**.

It will be understood that each of the elements described above, or two or more together may also find a useful application in other types of methods differing from the type described above.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claims, it is not intended to be limited to the details above, since it will be understood that various omissions, modifications, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.